

CLAIMS:

1. A water treatment apparatus for treating water in a device using water as a circulating medium, the apparatus comprising:

(a) an extractor line for removing water from the device;

(b) ozone generation means for producing and conveying a supply of ozone,

(c) a contactor/mixer member having an entry passage for receiving water from the extractor line and ozone from the ozone generation means, and a contacting passage for receiving a water and ozone mixture from the entry passage and configured so as to create turbulence to intimately mix the water and ozone along at least a portion of its length; and

(d) a return line for receiving and transporting the water and ozone mixture from the contacting passages back to the device.

2. A water treatment apparatus as claimed in claim 1 wherein the extractor line includes a pump for conveying water through the extractor line and contactor/mixer member.

3. A water treatment apparatus as claimed in claim 1 wherein ozone generation means comprises an ozone generator, an ozone passage and a venturi injector through which generated ozone is introduced to the entry passage of the contactor/mixer member.

4. A water treatment apparatus as claimed in claim 1 wherein the

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contacting passage comprises a series of pipes connected to each other in a non-linear arrangement to provide a water/ozone mixture passage having bends therein, wherein water and ozone gas flowing in the water/ozone mixture passage are subjected to shear at the bends to produce turbulent mixing in the pipes.

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10 5. A water treatment apparatus as claimed in claim 1 wherein the contacting passages have a plurality of deflecting baffles therein wherein water and ozone gas flowing in the water/ozone mixture passage is subjected to shear at the deflecting baffles.

15 6. A water treatment apparatus as claimed in claim 4 wherein the series of pipes comprises a plurality of substantially vertical pipes connected at right angles to a series of substantially horizontal pipes to form a helix-like configuration.

20 7. A water treatment apparatus as claimed in claim 6 wherein the vertical pipes are each approximately three feet in length, the horizontal pipes are each approximately six inches in length, the diameter of the vertical and horizontal pipes are approximately 2.5 inches, and ends of each vertical and horizontal pipe are connected to ends of its adjacent horizontal and vertical pipes respectively by a substantially right angled elbow joint.

25 8. A water treatment apparatus as claimed in claim 1 further

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comprising a spot treatment device for treating selected areas in the device with doses of a water and ozone mixture.

9. A water treatment apparatus as claimed in claim 9 wherein the spot treatment device comprises a support, a flexible hose through which is diverted a portion of water and ozone mixture downstream of the contactor member, and jet nozzles for ejecting the water and ozone mixture to a preselected location.

10. A water treatment apparatus as claimed in claim 9 further comprising magnetic means for anchoring the support at the preselected location.

11. A water treatment apparatus as claimed in claim 1 wherein the device using water as a circulating medium is a cooling tower having a water basin and tower fill elements above the water basin, and the return line transports the ozone and water mixture to a position at or near a top end of the fill elements of the device.

12. A water treatment apparatus as claimed in claim 1 further comprising a filter for removing particulate matter from water in the device.

13. A water treatment apparatus for treating water in a cooling tower having a water basin, tower fill elements positioned over the

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water basin and down which fill elements water cascades for the purposes of cooling the water, the apparatus comprising:

(a) a extractor line for removing water from the water basin for cleansing and purification treatment;

5 (b) ozone generation means for producing and conveying a supply of ozone;

(c) a contactor/mixer member having an entry passage for receiving water from the extractor line and ozone from the ozone generation means, a contacting passage for receiving a water and  
10 ozone mixture from the entry passage and configured so as to create turbulent mixing of water and ozone along at least a portion of its length, and an exit passage for the water and ozone mixture; and

(d) a return line for receiving and transporting the water and ozone mixture from the exit passage back to the tower fill  
15 elements of the device, ozone being removed from the mixture by air stripping when cascading down the fill elements.

14. A water treatment apparatus as claimed in claim 13 wherein the contacting passage comprises a series of pipes connected to each  
20 other in a non-linear arrangement and comprised of a plurality of substantially vertical pipes connected at right angles to a series of substantially horizontal pipes to form a helix-like configuration, thereby providing a water/ozone mixture passage having bends therein, wherein water and ozone gas flowing in the  
25 water/ozone mixture passage is subjected to turbulence at the

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bends.

15. A method of treating water to remove bacterial and other impurities therefrom, the method comprising:

5 (a) conveying a supply of water requiring removal of impurities to a receiving passage of a contactor member;

(b) injecting a supply of ozone gas into the water in the receiving passage to form a water/ozone mixture;

10 (c) passing the water/ozone mixture through a sealed non-linear passage having a plurality of bends therein to thereby create shear forces and turbulence to maintain an intimate mixture of the water and ozone;

15 (d) providing the non-linear passage with sufficient length so that the ozone in the water/ozone mixture has sufficient time to destroy at least a portion of the bacterial and other impurities in the water;

(e) removing the ozone from the water/ozone mixture; and

(f) conveying the purified or partially purified water to a predetermined location for further use.

20 16. A method as claimed in claim 15 further comprising the step of diverting a stream of the water/ozone mixture to a selected area for spot treatment of water in that area determined to contain impurities.

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17. A method as claimed in claim 15 wherein the water requiring removal is drawn from the water basin or sump of a cooling tower, the ozone is substantially removed from the water/ozone mixture in the fills of the cooling tower, and the predetermined location to which the purified or partially purified water is conveyed is the water basin of the cooling tower via the fills thereof.